Design Standards

Design Standards – Geometric Design

A. Horizontal Curves

1. Minimum curve radii with and without superelevation are shown in the Roadway Design section for the various classifications of streets. These radii are derived from the California Department of Transportation (CalTrans) Highway Design Manual comfortable speed on horizontal curves chart.

2. Superelevation

a. Local streets and two-lane residential collectors should not be superelevated at curves.

b. Superelevation is allowed on all other streets if required to maintain the design speed along curves.

c. When superelevation is required, the minimum amount permitted is plus 2 percent. The maximum superelevation permitted, regardless of circumstances, is 4 percent for design speeds of 30 mph (50 km/h) and lower, 6 percent for urban classifications with design speeds between 35 mph (60 km/h) and 45 mph (70 km/h), and 10 percent for rural classifications and for design speeds of 50 mph (80 km/h) and higher.

d. Superelevation must be designed to show length, transition, and crown runoff. Design must follow CalTrans standards as provided in its Highway Design Manual, Chapter 200.

e. Superelevation shall extend uniformly from the flow line of the gutter on the high side of the street to the lip of the gutter on the low side of the street, keeping the standard slope of the gutter on the low side unchanged. This shall also include the slope of median gutters, if any, as shown in Regional Standard Drawing G-6.

f. All streets not superelevated shall be crowned at 2 percent.

3. Sight distance on horizontal curves shall be determined from CalTrans Highway Design Manual Figure 201.6, “Stopping Sight Distance on Horizontal Curves.”

4. Compound curves are prohibited.

5. Reversing Curves

a. Reversing curves are permitted; but, for all streets other than local streets, they must be separated by a tangent length adequate to provide safety of travel.

b. For non-superelevated reversing curves, the tangent length provided shall be compatible with probable driving speed, type of vehicle use, and individual curve radius and length.

c. Superelevated reversing curves shall be separated by tangents sufficient to contain all of the superelevation runoff required.

6. Knuckles. Knuckles may be approved on an exception basis for residential cul-de-sacs with 200 ADT or under, intersecting at right angles plus or minus 5 degrees. Knuckles should not be used in lieu of providing a 100-foot (30 m) minimum curve radius required on residential cul-de-sacs.

7. Sharp horizontal curves must not begin near the top of pronounced crest vertical curves or near the low point of pronounced sag vertical curves.

B. Vertical Curves

1. Vertical curves shall be designed to the current CalTrans Highway Design Manual Stopping Sight Distance based on design speed.

2. For local streets, the minimum acceptable vertical curve is ten feet (3 m) of curve for each one percent difference in grade.

3. Vertical curves leading into intersections shall be designed such that the grade immediately approaching a cross gutter is no greater than 4 percent.

4. Sight distance on vertical curves shall be determined from CalTrans Highway Design Manual figures 201.2 and 201.4, "Passing and Stopping Sight Distance on Crest Vertical Curves," and from CalTrans Figure 201.5, "Stopping Sight Distance on Sag Vertical Curves."

C. Intersections

1. Streets are to intersect at 90-degree angles or as close thereto as practicable.

2. Two streets intersecting opposite sides of a third street are to have the same points of intersection or else their centerlines are to be separated by a minimum of 120 feet (40 m) for local streets and a minimum of 200 feet (60 m) for all other streets on the third street.

3. Median breaks for intersections along major streets with other streets of collector or higher classification shall be no closer than one-fourth of a mile (400 m).

4. Full access intersections of local streets with major streets should be kept to a minimum, and such intersections shall be at least 500 feet (150 m) apart, measured between centerlines, and shall be farther apart where turn pockets dictate longer spacing. The need for left-turn storage may require a greater distance. Pedestrian access to transit and adjacent commercial uses should be considered in major street intersection spacing.

5. Local streets should not intersect primary arterials.

6. Maximum grade across intersections along local and two-lane sub-collector and two-lane collector streets shall not exceed 8 percent and along four-lane streets and greater shall not exceed 5 percent.

7. Curb return radius should accommodate the expected amount and type of traffic and allow for safe turning speeds at intersections. Curb return radius shall be installed in accordance with Table D-1.

Table D-1 Curb Return Radius [a]

	Local Residential	Collector	Major
Local Residential	15 ft (4.5m)	20 ft (6.0m)	30 ft (9.0m)
Collector	20 ft (6.0m)	25 ft (7.5m)	30 ft (9.0m)
Major	30 ft (9.0m)	30 ft (9.0m)	30 ft (9.0m)

a. Curb return radius for all other intersections not covered in Table D-1 shall be 30 feet (9.0m).

8. Sight distance at intersections must consider the following factors: grades, curvature, and superelevation.

a. The minimum corner sight distance (public or private street intersection) or multiple dwelling residential/ commercial/ industrial driveway with a collector or higher classification street shall be in conformance with AASHTO Standards.

b. Adequate sight distances at intersections and along horizontal curves must be obtained. A sight distance easement that requires fences, monuments, signs, landscaping, walls, and slopes or any other obstruction at and beyond the right-of-way line to be eliminated, kept low, or set back is only acceptable when relocation of the intersection or redesign of the curve does not permit adequate sight distance.

9. The City Engineer may prohibit parking at critical locations.

9. The City Engineer may control access along major streets at critical locations.

D. Transitions

1. No pavement widening transition is required to increase the number of travel lanes beyond that needed for drainage flow.

2. When reducing the number of through travel lanes, the paved section shall undergo a transition as follows:
for V > 40 mph, L = W x V;
for V < 40 mph, L = W x $V^2/60$;
where:
V = design speed, in miles per hour;
W = width of roadway transition, in feet;
and
L = transition length, in feet.

E. Cul-de-Sacs

1. Objectives
   a. Cul-de-sacs can be used to create quiet living environments and to minimize encroachments into steep topography or other sensitive environmental features. However, when utilizing cul-de-sacs, care should be taken to design an interconnected street pattern within a residential neighborhood in order to provide, to the maximum extent feasible, direct pedestrian/bicycle routes to local destinations.

   b. In an effort to encourage walking, bicycling, and transit as a viable means of transportation within residential neighborhoods, cul-de-sacs may be utilized within a subdivision so long as the development does not result in a circuitous street system that unnecessarily inhibits pedestrian circulation, discourages transit service, or causes added traffic impacts to other residences within the neighborhood.

2. Connections/Access
   a. When a cul-de-sac exceeds 150 feet (45 m) in length, and/or pedestrian or bicycle circulation is being or will be significantly impacted and the traffic levels on neighboring streets are being or will be degraded, additional design features, including but not limited to: 1) providing for pedestrian and bicycle connections through the cul-de-sac, or 2) the interconnection of the turnaround of the cul-de-sac with an adjacent local street, should be considered in order to provide access to adjacent streets or to adjacent land uses such as open space, parks, trails, or commercial areas.

b. The design of pedestrian and bicycle access ways should address the following to provide for the safety of users:
   (1) Length should be kept to a minimum, normally not in excess of 200 feet (60 m).
   (2) Adequate lighting should be provided.
   (3) Landscaping, fences, grade differences, or other obstructions should not hinder visibility into the access way from adjacent streets and properties.
   (4) Surrounding land uses should be designed to provide surveillance opportunities from those uses into the access way, such as with the placement of windows.
   (5) Emergency vehicle access should be provided in cases where external surveillance is inadequate.

3. Industrial and Commercial Areas

a. Turnaround curb radius shall be 55 feet (16.8m).

b. Such cul-de-sacs shall be limited to 500 feet (150 m) in length from property line of the intersecting street to end of the bulb unless there are clearly defined topographic conditions requiring greater lengths. In such instances, such as intermediate turnarounds, or secondary emergency vehicle only access may be required.

4. Residential Areas

a. Cul-de-sacs serving more than four dwelling units or over 150 feet (45 m) in length and dead-end alleys require a turn-around. Cul-de-sacs of 150 feet (45 m) or less shall be developed such that access can be provided without backing onto streets intersecting the cul-de-sac.

b. Turnaround curb radius shall be 50 feet (15.0 m).

c. Turnaround curb radius may be reduced to 35 feet (10.7 m) if cul-de-sac length is less than 150 feet (45m), measured to the end of the bulb.

d. Residential cul-de-sacs are limited to a maximum of 200 ADT unless there are clearly defined topographic constraints that require greater volumes. Intermediate turnarounds shall have a 50-foot (15.0 m) radius. In all cases, wider roadways, intermediate turnarounds, and/or special design may be required to accommodate access by emergency vehicles and/or emergency evacuations.

Design Standards – Street Element Design

A. Standard Drawings

Most design details, location requirements, pavement computations, and construction methods are included in San Diego Regional and City of San Diego Standard Drawings

B. Street Requirements

Curb-to-curb width is that distance between the curb lines of the respective curbs, as shown in San Diego Regional Standard Drawings.

C. Drainage

1. Street drainage is covered in detail in the City of San Diego Drainage Design Manual.

2. In streets with raised medians, storm water must be intercepted at the median in super-elevated sections to prevent flow at points of transition to crowned sections.

3. In superelevated streets, storm water must be intercepted at side curbs to prevent flow from side streets across the superelevated street.

4. Minimum grade is 0.6 percent unless drainage conditions cause a steeper minimum grade to be required in accordance with City of San Diego Drainage Design Manual.

D. Medians

1. All center medians shall be raised, bounded by 6-inch B-2 concrete curbs and surfaced with stamped concrete, brick pavers, or other decorative paving as called for in the City of San Diego Standard Drawings.
2. Landscaped medians shall conform to City of San Diego Standard Drawing SDG-112. Maintenance for landscaped medians shall be provided for through a maintenance assessment district or by other agreement with the City of San Diego.

E. Pavement

1. Streets shall be paved with asphalt concrete over cement-treated base, concrete, or full-depth asphalt concrete in accordance with City of San Diego Standard Drawing, SDG-113 or with a com-parable structural section approved by the City Engineer.

2. P.C.C. pavement is required for streets with grades greater than 12 percent.

3. The same pavement section is required in shoulders as well as driving lanes, except for rural road classifications.

4. Concrete bus pads are required for bus stops along main transit corridors and shall consist of nine inches of Portland cement concrete. Refer to MTDB Design Guidelines for other dimensions.

5. Raised pavement markers are required for all streets of collector or greater classification. Installation and criteria must be according to the latest edition of the State of California Traffic Manual.

6. Stamped concrete or other types of decorative paving will be permitted in the traveled roadway of a public and/or private street provided the following conditions are met:
   a. At signalized intersections to designate pedestrian crosswalks (brick pavers, but not stamped concrete, may be used);
   b. The street grade is 8 percent or less;
   c. Maintenance is assured by either an encroachment removal agreement or by inclusion in an assessment district.

   Construction plans shall be prepared by a Registered Civil Engineer and shall indicate the location, color, type of material, and stamping pattern. Decorative paving may be allowed at other locations through the deviation process (see Appendix VIII).

7. Stamped concrete or other types of decorative paving will not be permitted at non-signalized intersections to designate pedestrian crosswalks or at locations where it might appear to be a pedestrian crosswalk, in cross-gutters or gutters, or to be used to delineate pedestrian ramps. Stamped concrete or other types of decorative paving is permitted at locations designated and marked as pedestrian crosswalks.

8. Engineers are cautioned that use of stamped concrete in residential areas may cause adverse community reaction due to noise where the roadway is immediately adjacent to dwelling units.

F. Rolled curbs

Rolled curbs are not permitted on publicly dedicated streets but may be used on private streets where the grade does not exceed 5 percent.

G. Right-of-Way

That portion of the right-of-way beyond curbs shall slope upward away from the street at 2 percent grade.

H. Sidewalks

Widths

1. Minimum widths are set forth in the Parkway configuration.

Section for various street classifications. The width of a contiguous sidewalk is measured from the back of the curb.

3. Sidewalk widths are intended to be clear widths. Where fire hydrants, street furniture, or other above ground appurtenances reduce such width, additional sidewalk shall be constructed around the obstacles.
4. Where feasible, the location of transit stops and shelters shall be determined and the sidewalk width shall be 10 feet (3.0 m) where shelters are proposed. Other bus stop locations shall provide eight feet (2.4 m) of sidewalk. The wider sidewalk widths for bus shelters shall extend for 25 feet (8 m) parallel to the curb measured from the bus stop sign. Refer to MTDB design guidelines for further information. This will provide adequate clearance to accommodate bus lifts for disabled persons.
5. Sidewalks less than 5 ft (1.5m) in continuous width shall provide passing space at reasonable intervals not to exceed 200 ft (61 m). Passing space shall provide a 5ft by 10ft (1.5m by 1.5 m) (1.5 m by 3.0 m) minimum clear space and may be provided at driveways, at building entrances, and at sidewalk intersections.

Locations

1. Sidewalk areas within curb returns are to be completely paved at all collector, major, and primary arterial intersections, and at other intersections where significant pedestrian volumes are anticipated.
2. A variation or transition in sidewalk location from that recommended above shall be considered to achieve consistency with existing adjacent sidewalks.
3. Transitions shall be four-to-one.

Curb Ramps

1. All sidewalk installations are to include curb ramps at curbed intersections, T intersections, and alley aprons.
2. Installation of two curb ramps per corner is required for new intersections.
3. Existing intersections to be retrofitted for curb ramps, only one curb ramp per corner is required.

Innovative Sidewalks

Innovative sidewalks, including meandering sidewalks, are encouraged for area enhancement and to avoid existing features such as trees and

may be approved on an individual basis provided they are located within the street right-of-way and maintenance of the area between the side-walk and curb is provided by special assess-ment district or other agreement with the City of San Diego. All other requirements shown in Standard Drawings, such as 2 percent fall between property line and face of curb, should be complied with. Sidewalks and the pedestrian path shall be parallel to the curb to the greatest extent practicable.

Construction
Sidewalks shall be paved with four inches (100 mm) of Portland cement concrete.

I. Landscape Requirements
Street trees are urban amenities whose value is recognized in many of the City's land use policy documents. These documents call for street tree plantings to achieve various goals including: establishing and preserving neighborhood character, encouraging commercial revitalization, and creating a comfortable pedestrian environment. For requirements for street trees and other landscaping in the right-of-way, refer to the citywide Landscape Regulations (San Diego Municipal Code 101.0700) and the associated Landscape Technical Manual.

The citywide Landscape Regulations addresses requirements such as the quantity, distribution, size, selection, and approval of plant material, including street trees. The Landscape Technical Manual establishes standards, guidelines, and criteria for all landscaping in the public right- of-way, such as: locational criteria (distance of trees from the face of curb for certain street classifications and speeds, and from traffic signals, signs, and underground utilities), plant selection, maintenance, median landscaping, irrigation, and elec-trical services.

For all street trees and landscape plantings in roadway islands, watering and maintenance will be assured through an agreement with the City, such as a street tree permit, encroachment removal and maintenance agreement, or maintenance assessment district.

J. Driveways
1. Access to private property from public and private streets shall be by standard concrete driveways. Curb returns will be permitted when the driveway is signalized. Driveway widths on streets with collector or higher classification shall be consistent with the Land Development Code. Driveways shall be designed such that access can be provided without backing onto streets that are collector or higher.

2. No driveway access is normally permitted to a primary arterial. Should a lot have frontage only on a primary arterial, driveway access limited only to right turns in and out will be permitted at locations and under conditions specified by the City Engineer and may require an additional lane.

3. Median breaks for driveway access to major streets will not normally be permitted unless all the following conditions exist:
   a. The property to be served is a major traffic generator and has a continuous frontage of 1,200 feet (360 m) or more along the major street and is situated between streets that intersect the major street from the side occupied by the property.

   b. The median opening is not less than 600 feet (180 m) from an intersection with a major or collector street.

   c. The median opening is not less than 400 feet (120 m) from an intersection with a local street. The need for left-turn storage may require a greater distance.

d. The median opening is not less than 600 feet (180 m) from any other existing or proposed mid-block median opening.

e. All costs, i.e., base material, surfacing, traffic safety street lighting, traffic signals, reconstruction or utility relocation required by a mid-block opening will be borne by the requesting party.

L. Guardrail and Safety Devices

1. All guardrail installations must be done in conformance with the latest edition of State of California Traffic Manual and Regional/City of San Diego Standard Drawings.
2. Guardrail may be required at certain locations for safety purposes in accordance with guidelines in the State of California Traffic Manual.
3. Reflectors and other safety structures may be required when necessary for public safety.
4. Where fire hydrants are required, guardrail shall be installed in a manner so as to not interfere with the operation of such hydrants.

M. Street Name Signs

Metal street name signs on metal posts are required at each intersection, at any point of street name change, and at midpoint in blocks over 2,000 feet (600 m) in length, in conformance with City of San Diego Standard Drawings.

N. Traffic Control and Signalization

Where two or more streets intersect, some form of traffic control is usually needed to define the right-of-way of the vehicles entering the intersection. This control can take the form of yield signs, stop signs on the minor street, all-way stop control, or traffic signals. Stop signs and all-way stop controls are installed according to City Council Policy 200-8. Traffic signals are installed according to City Council Policy 200-6. These Council Policies prescribe warrants based on City, state of California, and federal standards. The warrants take into consideration vehicular and pedestrian volumes, accident history, traffic safety, the transportation system, and other relevant factors.

When traffic signals are synchronized and operating in a coordinated system, they can facilitate the flow of vehicular traffic along a street corridor and within a network of streets. Coordinated traffic signals can reduce delay and travel times of vehicles, minimize the number of stops and starts and improve air quality by reducing vehicular emissions caused by the starts and stops. For efficient coordination, intersections controlled by traffic signals should be spaced approximately one-fourth mile (400 m) to one-half mile (800 m) apart.

O. Street Furniture

1. Street Furniture and above-ground appurtenances placed in the public right-of-way shall conform to the requirements set forth in the San Diego Municipal Code and applicable council policies.

2. Street Furniture and above-ground appurtenances shall be located in a fashion that preserves the safety, integrity, and layout of the pedestrian passageway and assures that the right of the public to use the public sidewalk is not unreasonably restricted.

3. Bicycle racks, where placed in the public right-of-way, should be sited in a well-lit area as close to building entrances and regular foot traffic as possible without unreasonably restricting pedestrian passageway. The rack must support the bicycle frame (not the wheel) at two points of contact and permit the use of a U-shaped lock to secure the frame and one wheel. The rack must be positioned to provide 2 feet by 6 feet (0.6m by 1.8m) of space per bicycle.

Design Standards- Planned Residential Developments

A. General
These standards shall apply only to areas that have an approved Planned Residential Development Permit.

B. Private Streets
1. Private streets may be utilized where there is a homeowner=s association established that would maintain the street system.

2. The entrance to private streets shall advise the public of the nondedicated status of the street system and shall have an entrance design that visibly reinforces the private access. As a minimum, absent other design features, this design shall consist of signage designating the street as private. Such entrances must be provided with adequate visitor parking and turnaround facilities.

3. Private streets shall be designed and constructed to the same structural, geometric, lighting, and drainage standards as dedicated streets. Private streets with parking on both sides of the street shall have a minimum curb-to-curb width of 34ft (10.2 m).

4. General utility easements will be required over private streets. Width of easement should be consistent with street right-of-way.

C. Driveways
1. Driveways, where permitted in lieu of either dedicated or private streets, must be designed to allow direct access to all developed areas of the project.

2. Driveways serving as fire lanes shall be designed with a semi truck turning radius of 50 feet (*15.2 m*).

3. Minimum driveway width shall be consistent with the Land Development Code, with a 26-foot (*7.9 m*) width within 20 feet (*6.0 m*) of a fire hydrant.

D. Walkways
A system of improved all-weather walkways must be provided connecting each dwelling unit to street sidewalks within and adjacent to the development and to major points of pedestrian attraction within the development.

E. Parking on Private Streets and Driveways
1. Parking shall meet the minimum requirements established by the applicable zone as contained in the Municipal Code.

2. An unobstructed minimum distance of 25 feet (7.5 m) from the circulation driveway curb to the structure or carport area and not less than 20 feet (6.0 m) from the back of sidewalk shall be provided.

3. Parking bays, both parallel and perpendicular, may be utilized on low-volume residential streets. Such facilities, normaly, would be included within the right-of-way or private street easement and would be maintained as part of the street. Where a sidewalk is located on the same side of the roadway as the parking bay, a continuous walkway must be maintained either by restricting parking within four feet of the extended curb line or by providing an improved walkway around the parking bay. All parking bays shall accommodate full-size vehicles.